Heights of rivers referred to zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Cumberland River—Con.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Carthage, Tenn	257	30	36.0	1	5.1	23	17.2	30.9
Nashville, Tenn	175	40	38.3	4	8.5	22,23	22.4	29.8
Arkansas River.								
Wichita, Kans	730	10	2.6	6,7	1.7	30	2.1	0.9
Webbers Falls, Ind. Ter.	407	23	18.1	24	2.8	15,16	6.6	15.3
Fort Smith, Ark	345	22	19.2	24	3.9	10,15-17	7.4	15.3
Dardanelle, Ark	250	21	19.2	25	3.0	12,13	6.8	16.2
Little Rock, Ark	170	23	20.4	26	4.3	14	8.3	16.1
White River.								
Newport, Ark	150	26	22.2	27	7.0	16	11.2	15.2
Yazoo River.								
Yazoo City, Miss	80	35	35.8	9-14	33.5	30	25.3	2.3
Red River.								
Arthur City, Tex	688	27	10.6	24	4.5	{1-14 / 16-21}	5.7	6.1
Fulton, Ark	565	28	20.3	27	3.4	15,16	7.6	16.9
Shreveport, La	449	29	11.8	29,30	1.5	10,20	3.7	10.3
Alexandria, La	139	33	9.4	10	5.6	25,26	7.2	3.8
Ouachita River.								
Camden, Ark	340	39	26.2	27	7.6	6	14.1	18.6
Monroe, La	100	40	27.8	1	20.7	26-29	23.3	7.1
Atchafalaya Bayou.								
Melville, La	100†	31	33.4	21-30	32.2	1	33.0	1.2
Susquehanna River.								
Wilkesbarre, Pa	178	14	10.2	15	2.5	30	6.6	7.7
Harrisburg, Pa	70	17	8.8	10	3.4	30	5.8	5.4
W. Br. of Susquehanna.								
Williamsport, Pa	35	20	7.8	9,10	3.1	30	5.3	4.7
Juniata River.								
Huntingdon, Pa	80	24	.....	.....	.....	.....	.....	.....
Potomac River.								
Harpers Ferry, W. Va	170	16	5.3	10	2.4	27-30	3.5	2.9
James River.								
Lynchburg, Va	257	18	3.0	1	1.4	22-26,30	2.0	1.6
Richmond, Va	110	12	4.3	9	0.6	24-27	1.4	3.7
Roanoke River.								
Clarksville, Va	155	12	9.0	9	2.8	25	3.9	6.2
Weldon, N. C.	90	27	26.3	10	8.8	25	12.1	17.5
Cape Fear River.								
Fayetteville, N. C.	100	38	35.5	9	6.6	25	14.0	28.9
Lumber River.								
Fairbluff, N. C.	10	6	6.3	13,14	4.8	30	5.6	1.5
Edisto River.								
Edisto, S. C.	75	6	5.4	11	4.0	30	4.8	1.4
Pedee River.								
Cheraw, S. C.	145	27	23.8	9	5.0	25	10.6	18.8

Heights of rivers referred to zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Black River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Kingstree, S. C	60	12	9.1	20,21	6.2	30	7.7	2.9
Lynch Creek.								
Effingham, S. C.	35	12	12.0	8	6.7	25,28,30	9.3	5.3
Santee River.								
St. Stephens, S. C.	50	12	9.9	1	7.9	29,30	8.8	2.0
Congaree River.								
Columbia, S. C.	37	15	6.8	1	1.3	23,25,30	2.5	5.5
Wateree River.								
Camden, S. C.	45	24	23.0	9	6.3	25	11.8	16.7
Waccamaw River.								
Conway, S. C.	40	7	6.2	29,30	4.3	6,7	5.0	1.9
Savannah River.								
Calhoun Falls, S. C.	.....	.....	6.6	1	2.9	24	4.4	3.7
Augusta, Ga	130	32	19.6	1	9.7	24	12.1	9.9
Broad River.								
Carlton, Ga	.....	.....	5.8	1	3.1	{18,21-24 / 29,30}	3.5	2.7
Flint River.								
Albany, Ga	80	20	8.3	1	5.0	15-17	6.5	3.3
Chatahoochee River.								
West Point, Ga	239	20	10.0	1	4.4	21	5.7	5.6
Eufaula, Ala	90	30	15.0	2	6.6	23	9.0	8.4
Coosa River.								
Rome, Ga	225	30	15.0	8	4.0	23	7.3	11.0
Gadsden, Ala	144	18	17.4	10	5.0	22	10.2	12.4
Alabama River.								
Montgomery, Ala	265	35	24.2	10	8.1	22	15.6	16.1
Selma, Ala	212	35	26.9	11	10.1	24	18.4	16.8
Tombigbee River.								
Columbus, Miss.	285	33	5.8	1	0.4	19,21,30	1.5	5.4
Demopolis, Ala[4]	155	35	51.7	1	8.9	25	26.1	42.8
Black Warrior River.								
Tuscaloosa, Ala	90	38	31.0	9	8.6	23	18.0	25.4
Columbia River.								
Umatilla, Oreg	270	25	9.8	28	4.0	5	7.2	5.8
The Dalles, Oreg	166	40	15.5	28,29	6.1	3	11.6	9.4
Willamette River.								
Albany, Oreg	99	20	9.5	14	5.2	2	7.4	4.3
Portland, Oreg	10	15	11.4	14	5.0	4	8.3	6.4
Sacramento River.								
Red Bluff, Cal.	241	23	6.0	1	3.4	11,12	4.3	2.6
Sacramento, Cal	70	25	24.2	1,2	20.2	30	22.7	4.0

[1] Record for 23 days. [2] Record for 20 days. [3] Record for 26 days. [4] Record for 29 days.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

Alabama.—The mean temperature was 61.6°, or about 3.0° below normal; the highest was 98°, at Pineapple on the 28th, and the lowest, 26°, at Valleyhead on the 2d. The average precipitation was 2.80, or more than 1.00 below normal, the deficiency being greatest in the southern portions; the greatest monthly amount, 7.18, occurred at Valleyhead, and the least, trace, at Evergreen.—*F. P. Chaffee.*

Arizona.—The mean temperature was 62.3°; the highest was 105°, at Blaisdell on the 9th, and the lowest, 11°, at Prescott on the 26th. The average precipitation was 0.20; the greatest monthly amount, 2.33, occurred at Oro Blanco, while none fell at a number of stations.—*W. G. Burns.*

Arkansas.—The mean temperature was 60.7°, or 2.3° below normal; the highest was 96°, at Conway on the 25th, and the lowest, 19°, at Pond and Silversprings on the 1st. The average precipitation was 3.28, or 1.30 below normal; the greatest monthly amount, 5.38, occurred at Mossville, and the least, 0.82, at Ozark.—*E. B. Richards.*

California.—The mean temperature for the State, obtained by weighting the reports from 288 stations, so that equal areas have about the same weight, was 58.1°, which was 0.2° above normal for the State, as determined from 205 records; the highest was 108°, at Elsinore, Riverside County, on the 8th, and the lowest, 7°, at Bodie, Mono County, on the 25th. The average precipitation for the State, as determined by the records of 312 stations, was 0.60; the deficiency, as indicated by reports from 163 stations which have normals, was 1.39; the greatest monthly amount, 3.20, occurred at Crescent City, Del Norte County, while none fell at several stations.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 45.3°, or practically normal; the highest was 90°, at Lamar on the 12th and Minneapolis on the 25th, and the lowest, 15° below zero, at Breckenridge on the 6th The average precipitation was 0.74, or 0.66 below normal; the greatest monthly amount, 2.72, occurred at Ruby, while none fell at several stations.—*F. H. Brandenburg.*

Florida.—The mean temperature was 67.7°, or 2.3° below normal; the highest was 95°, at Wausau on the 28th, and the lowest, 32°, at the same station on the 10th. The average precipitation was 3.40, or 1.10 above normal; the greatest monthly amount, 10.75, occurred at Lemon City, and the least, 0.14, at Gainesville.—*A. J. Mitchell.*

Georgia.—The mean temperature was 62.4°, or 2.0° below normal; the highest was 95°, at Columbus on the 28th, and the lowest, 25°, at Diamond and Dahlonega on the 10th. The average precipitation was 2.73,or 0.46 below normal; the greatest monthly amount, 6.03, occurred at Greenbush, and the least, 0.83, at Leverett.—*J. B. Marbury.*

Idaho.—The mean temperature was 42.4°, or 2.3° below normal; the highest was 84°, at Hagerman on the 8th, and the lowest, 3°, at Swan Valley on the 17th. The average precipitation was 1.35, or 0.36 above normal; the greatest monthly amount, 5.28, occurred at Murray, and the least, 0.02, at Downey.—*S. M. Blandford.*

Illinois.—The mean temperature was 53.8°, or 1.1° above normal; the highest was 95°, at Bloomington on the 29th, and the lowest, 8°, at Streator on the 1st and at Minonk on the 2d. The average precipitation was 1.54, or 1.72 below normal; the greatest monthly amount, 4.64, occurred at Scales Mound, and the least, 0.14, at Chicago.—*C. E. Linney.*

Indiana.—The mean temperature was 54.4°, or about 2.5° above normal; the highest was 96°, on the 30th, and the lowest, 10°, at Lafayette and Topeka on the 2d. The average precipitation was 1.60, or about 1.75 below normal; the greatest monthly amount, 4.00, occurred at Jeffersonville, and the least, 0.13, at Hammond.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 48.9°, or about normal; the highest was 89°, at Thurman on the 12th, and the lowest, 1°, at Bedford on the 4th. The average precipitation was 2.40, or about 0.60 below normal; the greatest monthly amount, 5.76, occurred at Belle Plaine, and the

least, 0.56, at Northwood.—*J. R. Sage, Director; G. M. Chappel, Assistant.*

Kansas.—The mean temperature was 54.2°, or 1.5° below normal; the highest was 99°, at Englewood on the 10th, and the lowest, 3°, at Fanning on the 4th. The average precipitation was 1.63, or 0.92 below normal; the greatest monthly amount, 7.32, occurred at Independence, and the least, trace, at Meade.—*T. B. Jennings.*

Kentucky.—The mean temperature was 57.2°, or nearly normal; the highest was 96°, at Russellville on the 28th, and the lowest, 20°, at the same station on the 1st. The average precipitation was 3.16, or about 0.75 below normal; the greatest monthly amount, 4.75, occurred at Burnside, and the least, 1.35, at Vanceburg.—*H. B. Hersey.*

Louisiana.—The mean temperature was 64.9°, or 2.8° below normal; the highest was 93°, at Mansfield, Oakridge, and Plaquemine on the 29th, and the lowest, 30°, at Minden on the 1st. The average precipitation was 3.08, or nearly normal; the greatest monthly amount, 8.70, occurred at Jeanerette, and the least, 1.15, at Clinton.—*W. T. Blythe.*

Maryland and Delaware.—The mean temperature was 53.3°, or 1.0° above normal; the highest was 94°, at Boettcherville, Md., on the 30th, and the lowest, 14°, at Deerpark and Sunnyside, Md., on the 5th. The average precipitation was 1.56, or 1.77 below normal; the greatest monthly amount, 3.40, occurred at Frostburg, Md., and the least, 0.67, at Smithsburg, Md.—*F. J. Walz.*

Michigan.—The mean temperature was 46.7°, or 3.4° above normal; the highest was 94°, at Camden, Hillsdale County, on the 21st and 28th, and the lowest, 8° below zero, at Humboldt, Marquette County, on the 4th. The average precipitation was 1.28, or 1.18 below normal; the greatest monthly amount, 4.63, occurred at Iron Mountain, Dickinson County; at Hayes, Huron County, there was an entire absence of precipitation, and a number of stations in the southern section have monthly amounts of less than 0.25.—*C. F. Schneider.*

Minnesota.—The mean temperature was 44.0°, or about normal; the highest was 88°, at Lake Jennie and St. Olaf on the 25th, and the lowest, 17° below zero, at Pokegama on the 2d. The average precipitation was 1.49, or about 1.25 below normal; the greatest monthly amount, 3.19, occurred at Two Harbors.—*T. S. Outram.*

Mississippi.—The mean temperature was 63.1°, or about 2.0 below normal; the highest was 96°, at Brookhaven, on the 29th and at Yazoo City on the 30th, and the lowest, 27°, at Okolona on the 3d and at Ripley on the 8th. The average precipitation was 1.88, or 2.08 below normal; the greatest monthly amount, 4.11, occurred at Corinth, and the least, trace, at Kosciusko.—*H. E. Wilkinson.*

Missouri.—The mean temperature was 54.0°, or 2.8° below normal; the highest was 96°, at Jefferson City on the 28th, and the lowest, 6°, at at Kidder on the 1st. The average precipitation was 3.67, or 0.25 below normal; the greatest monthly amount, 6.88, occurred at Liberty, and the least, 1.62, at Louisiana—*A. E. Hackett.*

Montana.—The mean temperature was 40.0°, or 3.4° below normal; the highest was 82°, at Glendive on the 16th, and the lowest, 19° below zero, at Glasgow on the 1st. The average precipitation was 1.02, or nearly normal; the greatest monthly amount, 2.29, occurred at Utica, and the least, trace, at Billings and Yale.—*E. J. Glass.*

Nebraska.—The mean temperature was 49.0°, or 0.3° below normal; the highest was 97°, at Lynch on the 24th and 27th, and the lowest, 5° below zero, at Hay Springs on the 1st. The average precipitation was 0.99, or 1.50 below normal; the greatest monthly amount, 4.63, occurred at Nebraska City, and the least, trace, at Holdrege, Cody, and Merriman.—*G. A. Loveland.*

Nevada.—The mean temperature was 47.9°, or about 1.3° below normal; the highest was 87°, at Sodaville on the 16th, and the lowest, 12°, at Palmetto on the 28th. The average precipitation was 0.37, or about 0.21 below normal; the greatest monthly amount, 1.16, occurred at Elko, while none fell at Silver Peak. During the cold spell at the close of the month the fruit crop was practically destroyed, grain and alfalfa badly damaged, and a large number of calves and young lambs were destroyed by the unusually cold, freezing weather.—*J. H. Smith.*

New England.—The mean temperature was 44.2°, or about 1° above normal; the highest was 92°, at North Conway, N. H., on the 29th, and the lowest, 2°, at Berlin Mills, N. H., on the 5th. The average precipitation was 1.68, or 1.33 below normal; the greatest monthly amount, 3.23, occurred at Hartford, Conn., and the least, 0.54, at Berlin Mills, N. H. The weather during April presented a marked contrast with conditions prevailing in March, and also with those of one year ago, and well illustrated the variability of New England climate. Disagreeable elements were almost wholly absent, and more pleasant weather for the period of the year could scarcely have been expected. —*J. W. Smith.*

New Jersey.—The mean temperature was 49.9°, or 0.3° above normal; the highest was 88°, at Hightstown on the 30th, and the lowest, 18°, at Charlotteburg on the 6th. The average precipitation was 1.73, or 1.61 below normal; the greatest monthly amount, 3.25, occurred at Charlotteburg, and the least, 0.48, at Toms River.—*E. W. McGann.*

New Mexico.—The mean temperature was 53.6°, or 0.2° above normal; the highest was 96°, at Eddy on the 26th, and the lowest, 10°, at Winsors on the 6th and 21st. The average precipitation was 0.24, or 0.15 below normal; the greatest monthly amount, 1.35, occurred at Los Lunas, while there was none at Albert, Clayton, Deming, Engle, and Springer, and only trace at Bluewater, Lower Penasco, Olio, and San Marcial.—*R. M. Hardinge.*

New York.—The mean temperature was 46.5°, or 2.4° above normal; the highest was 89°, at Dryden on the 29th and at Nunda on the 30th, and the lowest, 4°, at North Lake on the 5th. The average precipitation was 1.49, or 1.11 below normal; the greatest monthly amount, 2.94, occurred at North Lake, and the least, 0.18, at Cherry Valley. April was unusually dry, the precipitation reported from some sections being the lightest on record. Farm work was generally delayed during the first half of the month, but operations were rapidly expedited during the last two weeks.—*R. G. Allen.*

North Carolina.—The mean temperature was 55.8°, or about 2.0° below normal; the highest was 89°, at Fayetteville on the 14th, and the lowest, 18°, at Linnville on the 5th. The average precipitation was 3.57, or about 0.20 below normal; the greatest monthly amount, 8.92, occurred at Southport, and the least, 1.80, at Currituck Inlet.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 38.4°, or 3.0° below normal; the highest was 86°, at Medora on the 23d, and the lowest, 22° below zero, at McKinney on the 2d. The average precipitation was 1.37, or 1.31 below normal; the greatest monthly amount, 4.20, occurred at University, and the least, 0.40, at Portal.—*B. H. Bronson.*

Ohio.—The mean temperature was 53.3°, or 2.2° above normal; the highest was 94°, at Logan on the 29th and at Portsmouth on the 30th, and the lowest, 6°, at Hillhouse on the 3d. The average precipitation was 1.61, or 1.58 below normal; the greatest monthly amount, 4.45, occurred at Canton, and the least, 0.44, at Van Wert.—*J. Warren Smith.*

Oklahoma.—The mean temperature was 59.7°, or 1.2° below normal; the highest was 97°, at Norman on the 18th, and the lowest, 18°, at Hopeton on the 1st. The average precipitation was 3.62, or 0.73 above normal; the greatest monthly amount, 6.30, occurred at Pawhuska, and the least, 0.20, at Mangum.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 47.0°, or 0.8° below normal; the highest was 86°, at Vernonia on the 7th, and the lowest, 12°, at Silverlake on the 19th. The average precipitation was 3.92, or 0.10 above normal; the greatest monthly amount, 16.81, occurred at Glenora, and the least, 0.02, at P. Ranch.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 50.2°, or 2.2° above normal; the highest was 92°, at Derry Station on the 30th, and the lowest, 2°, at Saegerstown on the 3d. The average precipitation was 1.76, or 1.45 below normal; the greatest monthly amount, 3.25, occurred at Hawthorn, and the least, 0.70, at St. Marys.—*T. F. Townsend.*

South Carolina.—The mean temperature was 60.0°, or 2.8° below normal; the highest was 91°, at St. Matthews on the 29th, and the lowest, 27°, at Central on the 2d, 5th, and 10th. The average precipitation was 3.02, or 0.12 below normal; the greatest monthly amount, 5.57, occurred at Smiths Mills, and the least, 1.32, at Winnsboro.—*J. W. Bauer.*

South Dakota.—The mean temperature was 44.5°, or about 2.0° below normal; the highest was 90°, at Plankinton on the 26th, and the lowest, 12° below zero, at Ashcroft on the 2d. The average precipitation was 1.55, or about 0.86 below normal; the greatest monthly amount, 4.15, occurred at Fort Meade, and the least, 0.20, at Hot Springs—*S. W. Glenn.*

Tennessee.—The mean temperature was 57.8°, or 1.0° below normal; the highest was 97°, at Dover on the 29th, and the lowest, 17°, at Erasmus on the 2d. The average precipitation was 3.47, or 0.82 below normal; the greatest monthly amount, 6.72, occurred at Oak Hill, and the least, 1.30, at Arlington.—*H. C. Bate.*

Texas.—The mean temperature, determined by comparison of 43 stations distributed throughout the State, was 2.7° below the normal; it was about normal or slightly above over west Texas, while there was a general deficiency elsewhere ranging from 1° to 5°, with the greatest in the vicinity of Fort Ringgold; the highest was 108°, at Fort Ringgold on the 28th, and the lowest, 24°, at Amarillo and Rhineland on the 1st, and at Marathon on the 6th. The average precipitation, determined by comparison of 51 stations distributed throughout the State, was 0.10 below the normal. The rainfall was nearly normal, except over the southern portion of the panhandle, east Texas, and the southern portion of central Texas, where there was a deficiency ranging from 1.00 to 3.44, and the eastern portion of north Texas and the northern portion of central Texas, where there was an excess ranging from 1.94 to 2.68, with the greatest in the vicinity of Albany; the greatest monthly amount, 6.96, occurred at Runge, while none fell at Eagle Pass.—*I. M. Cline.*

Utah.—The mean temperature was 48.2°, or 0.5° above the normal; the highest was 90°, at Moab and St. George on the 9th, and the lowest, 11°, at Grover on the 20th. The average precipitation was 0.58, or 0.33 below normal; the greatest monthly amount, 1.54, occurred at Huntsville, and the least, trace, at Castle Dale, Cisco, and Pahreah.—*L. H. Murdoch.*

Virginia.—The mean temperature was 54.3°, or about 0.4° below normal; the highest was 95°, at West Point on the 15th, and the lowest, 16°, at Leesburg on the 3d and Burkes Garden on the 5th. The average precipitation was 1.94 or 1.36 below normal; the greatest monthly amount, 4.22, occurred at Wytheville, and the least, 0.21, at Clifton Forge.—*E. A. Evans.*

Washington.—The mean temperature was 47.0°, or 1.5° below normal; the highest was 80°, at Lind on the 15th, and the lowest, 18°, at Cedonia on the 13th. The average precipitation was 3.80, or about 0.50 above normal; in the western section it was about 1.50 above normal; the greatest monthly amount, 14.01, occurred at Clearwater, and the least, 0.7, at Moxee. The month was cold throughout, the temperature being the lowest of any April since 1896, and the spring the most backward since 1893. Farming operations have been greatly delayed, and crops have made poor progress.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 53.4°, or 1.2° above normal; the highest was 93°, at Morgantown and Uppertract on the 30th, and the lowest, 18°, at Beverly on the 5th. The average precipitation was 1.84, or 1.12 below normal; the greatest monthly amount, 3.17, occurred at Charleston, and the least, 0.92, at Oldfields.—*C. M. Strong.*

Wisconsin.—The mean temperature was 47.2°, or about 2.0° above normal the lowest temperatures occurred from the 1st to the 3d, and the highest from the 25th to 29th. The average precipitation was 2.42, or slightly below normal; the distribution was excellent.—*W. M. Wilson.*

Wyoming.—The mean temperature was 41.5°, or about normal; the highest was 92°, at Carbon on the 24th, and the lowest, 3° below zero, at Sheridan on the 1st. The average precipitation was 0.86, or 0.60 below normal; the greatest monthly amount, 2.30, occurred at Fort Yellowstone, while none fell at Cody and Wamsutter.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

SUN SPOTS AND HAWAIIAN ERUPTIONS.

By CURTIS J. LYONS (dated Honolulu, April 27, 1897.)

The following table showing the relation between the years of least sun spots, as actually observed by astronomers, and the dates of the more prominent volcanic outbursts on Hawaii certainly suggests some connection between the two. The sun-spot periods are from the United States MONTHLY WEATHER REVIEW for December, 1897:

Years of minimum sun spots.	Years of most important lava flows or eruptions.
(?)	1790 (Kilauea Keoua eruption)
1799	1801 Hualalai.
1810	(?)
1823	1823 Mauna Loa.
1833	1832 Mauna Loa and Kilauea.
1843	1840 Kilauea.
	1843 Mauna Loa.
1856	1852, 1855, 1859 Mean 1856. Mauna Loa.
1867	1868 Mauna Loa.
1878	1880-81 Mauna Loa.
1889	1887 Mauna Loa, south slope.
1900 (Probable)	....

The variation in number of sun spots during the average 11-year cycle is strongly marked, the ratio of maximum to minimum being about as 80 to 10, and sometimes greater. It is an accepted fact, I believe, that the solar heat is slightly greater when there are the fewest spots, but how this should cause volcanic outbreak does not appear. It may be the expansion, on account of solar heat, of a fluid interior breaking through a rigid crust.

The next minimum period is due about 1900, as near as can be estimated from past intervals, so without being in any way alarmists, it is reasonable for us to look for a probable lava flow at some time between now and 1901. The Hawaii lava flows are generally confined to desolate parts of the island.

This is not to be considered as a prediction but simply a statement of facts. The lava flows of Mount Ætna have followed, in a measure, the same period.

NOTE.—We publish the above note at the request of Mr. Lyons, but must call attention to the fact that if there be any causal connection, or any true chronological coincidence between the minimum sun spots and the important eruptions on Hawaii, then this relation should, also, be established by studying the agreement of the years of maximum sun spots with the years of no eruption. The above paper presents only one side of the question; the truth can only be attained by studying all sides, and by demonstrating that the eight approximations here quoted were not purely accidental. Everything points to an intimate connection between solar, terrestrial, and cosmic phenomena, but the nature and limitations of this connection can only be ascertained by a more elaborate study of such hypotheses as are implied in the above interesting note by Mr. Lyons.—ED.

A TALK ON ELEMENTARY METEOROLOGY.

By GEORGE MILLARD DAVISON, A. B.

[Given before the Teachers' Institute of Fulton County, N. Y., April 11, 1899.]

NOTE.—This present paper by Mr. Davison, principal of Gloversville High School, illustrates the general style of a popular lecture for teachers and scholars. The subject of meteorology is now being introduced into all the public schools as a necessary subject of instruction. The subjects touched upon in Mr. Davison's lecture before the Teachers' Institute of Fulton County would, of course, be treated more at length in several separate talks when the teachers present the matter to young pupils. The general object of such a lecture is to give the teachers briefs of points that must be elaborated in the class room. In the present crude condition of instruction in meteorology it is, of course, not to be expected that the most advanced physical theories with regard to atmospheric phenomena shall be presented to young pupils, or even that they should be understood by all the teachers. The subject must first be taught more thoroughly, both by the study of nature and of text-books, in the universities, colleges, and normal schools. Meanwhile elementary lectures, such as this by Mr. Davison, will serve as a model for plain talks to the children and their teachers.—ED.

In discussing the subject of meteorology, to-day, I shall not limit it to its commonly accepted meaning, as that which concerns the weather, but shall treat it in its general meaning as seen in the derivation of the word, namely, phenomena which have to do with air; nor shall I discuss obscure things, about which even scientists know comparatively little, but shall talk of ordinary phenomena, with which all are more or less familiar.

To the child all space seems empty, except that which is occupied by something he can see or touch, as houses, trees, rocks, etc. Air he does not see; but if you put into his hand a fan and ask him to wave it vigorously to and fro, he will discover that the fan meets with resistance which can only be overcome by the exertion of muscular effort on his part. In this way you can prove to him that air is a real, tangible substance. That it is made up of several different substances you can show by this simple experiment: If in a saucer partly filled with water I place a lighted candle and over it invert a tumbler so that the lower rim is slightly immersed in the water, the candle soon goes out. The fact that the water is drawn up into the tumbler shows that the volume of air has been diminished. If now I lift the tumbler carefully and put in a lighted match, the match goes out, showing that the tumbler contains a substance which will not burn nor support combustion. This is chiefly nitrogen. The other substance of which air is largely composed—that which enables fire to burn and which was exhausted when the tumbler was placed over the lighted candle—is oxygen. It is oxygen which, when taken into the lungs, cleanses the blood and thus supports life.